

**What is claimed is:**

5           1. An electromagnetic radiation immune tissue invasive stimulation system, comprising:

          a photonic lead having a proximal end and a distal end;

          a light source, in the proximal end of said photonic lead, to produce a first light having a first wavelength;

10           a wave-guide between the proximal end and distal end of said photonic lead;

          a distal sensor, in the distal end of said photonic lead, to convert the first light into electrical energy into control signals;

          an electrical energy storage device to store electrical energy; and

15           a control circuit, in response to said control signals, to cause a portion of the stored electrical energy to be delivered to a predetermined tissue region.

20           2. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is a region of the spinal cord.

25           3. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is a region of the brain.

4. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is a region associated with a deep brain structure.

5. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is the vagal nerve.

6. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is peripheral nerves that innervate muscles.

7. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is sacral nerve roots to elicit functional contraction of muscles innervated by the sacral nerve roots.

8. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the sacral nerve roots are associated with bladder function.

9. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is a region of the cochlea.

10. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is a region of the stomach.

5 11. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 1, wherein the predetermined tissue region is the hypoglossal nerve.

10 12. An electromagnetic radiation immune tissue invasive sensing system, comprising:

a photonic lead having a proximal end and a distal end;

a light source, in the proximal end of said photonic lead, to produce a first light having a first wavelength;

15 a wave-guide between the proximal end and distal end of said photonic lead;

a distal sensor, in the distal end of said photonic lead, to convert the first light into electrical energy into control signals;

an electrical energy storage device to store electrical energy; and

20 a bio-sensor, in the distal end of said photonic lead, to sense a characteristic of a predetermined tissue region;

said light source, in the proximal end of said photonic lead, producing a second light having a second wavelength;

25 said distal sensor, in the distal end of said photonic lead and responsive to said bio-sensor, to reflect the second light back the proximal end of said photonic lead such that a characteristic of the second light is

modulated to encode the sensed characteristic of the predetermined tissue region.

13. The electromagnetic radiation immune tissue invasive stimulation  
5 system as claimed in claim 12, wherein the sensed characteristic is an ECG.

14. The electromagnetic radiation immune tissue invasive stimulation  
system as claimed in claim 12, wherein the sensed characteristic is an  
esophageal ECG.

15. The electromagnetic radiation immune tissue invasive stimulation  
system as claimed in claim 12, wherein the sensed characteristic is a level of  
oxygen.

16. The electromagnetic radiation immune tissue invasive stimulation  
system as claimed in claim 12, wherein the sensed characteristic is blood  
pressure.

17. The electromagnetic radiation immune tissue invasive stimulation  
20 system as claimed in claim 12, wherein the sensed characteristic is  
intracranial pressure.

18. The electromagnetic radiation immune tissue invasive stimulation  
system as claimed in claim 12, wherein the sensed characteristic is  
25 temperature.

19. The electromagnetic radiation immune tissue invasive stimulation system as claimed in claim 12, wherein the sensed characteristic is an EKG.